

What is claimed is:

1. A recombinant nucleic acid molecule comprising a heterologous nucleic acid coding sequence encoding a plant long chain fatty acid condensing enzyme, wherein:
- 5 a) the nucleic acid coding sequence is derived from an *Arabidopsis KCS2* coding sequence; or
- b) the plant very long chain fatty acid condensing enzyme catalyses the condensation of malonyl-CoA with a C16, C18, C20 or C22 acyl-CoA, wherein the plant very long chain fatty acid condensing enzyme has an amino acid sequence that is at least 70% identical to an
- 10 *Arabidopsis KCS2* amino acid sequence when optimally aligned; or
- c) the nucleic acid coding sequence hybridizes under stringent conditions to a complement of the *Arabidopsis KCS2* coding sequence; or
- d) the nucleic acid coding sequence at least 70% identical to the *Arabidopsis KCS2* coding sequence when optimally aligned.
- 15 2. The recombinant nucleic acid molecule of claim 1 wherein the nucleic acid coding sequence is derived from the *Arabidopsis KCS2* coding sequence.
3. The recombinant nucleic acid molecule of claim 1 wherein the plant very long chain
- 20 fatty acid condensing enzyme catalyses the condensation of malonyl-CoA with a C16, C18, C20 or C22 acyl-CoA, wherein the plant very long chain fatty acid condensing enzyme has an amino acid sequence that is at least 70% identical to the *Arabidopsis KCS2* amino acid sequence when optimally aligned.
- 25 4. The recombinant nucleic acid molecule of claim 1 wherein the nucleic acid coding sequence hybridizes under stringent conditions to the complement of the *Arabidopsis KCS2* coding sequence.
5. The recombinant nucleic acid molecule of claim 1 wherein the nucleic acid coding
- 30 sequence at least 70% identical to the *Arabidopsis KCS2* coding sequence when optimally aligned.

6. The recombinant nucleic acid molecule of claim 1 wherein the nucleic acid coding sequence at least 90% identical to a wild-type *Arabidopsis KCS2* coding sequence when optimally aligned.

5 7. The recombinant nucleic acid molecule of claim 1 wherein the nucleic acid coding sequence at least 95% identical to a wild-type *Arabidopsis KCS2* coding sequence when optimally aligned.

8. An isolated nucleic acid molecule comprising a nucleic acid coding sequence that encodes a plant long chain fatty acid condensing enzyme, wherein:

10 a) the nucleic acid coding sequence is derived from an *Arabidopsis KCS2* coding sequence; or

b) the plant long chain fatty acid condensing enzyme catalyses the condensation of malonyl-CoA with a C16, C18, C20 or C22 acyl-CoA, wherein the plant very long chain fatty acid condensing enzyme has an amino acid sequence that is at least 70% identical to an *Arabidopsis KCS2* amino acid sequence when optimally aligned; or

15 c) the nucleic acid coding sequence hybridizes under stringent conditions to a complement of the *Arabidopsis KCS2* coding sequence; or

d) the nucleic acid coding sequence is at least 70% identical to the *Arabidopsis KCS2* coding sequence when optimally aligned.

20 9. The isolated nucleic acid molecule of claim 8, wherein the nucleic acid coding sequence is derived from the *Arabidopsis KCS2* coding sequence.

25 10. The isolated nucleic acid molecule of claim 8, wherein the plant long chain fatty acid condensing enzyme catalyses the condensation of malonyl-CoA with a C16, C18, C20 or C22 acyl-CoA, wherein the plant very long chain fatty acid condensing enzyme has an amino acid sequence that is at least 70% identical to an *Arabidopsis KCS2* amino acid sequence when optimally aligned.

30 11. The isolated nucleic acid molecule of claim 8, wherein the nucleic acid coding sequence hybridizes under stringent conditions to a complement of the *Arabidopsis KCS2* coding sequence.

12. The isolated nucleic acid molecule of claim 8, wherein the nucleic acid coding sequence is at least 70% identical to the *Arabidopsis KCS2* coding sequence when optimally aligned.
- 5 13. The isolated nucleic acid molecule of claim 8, wherein the nucleic acid coding sequence is at least 90% identical to a wild-type *Arabidopsis KCS2* coding sequence when optimally aligned.
14. The isolated nucleic acid molecule of claim 8, wherein the nucleic acid coding
10 sequence is at least 95% identical to a wild-type *Arabidopsis KCS2* coding sequence when optimally aligned.
15. A recombinant nucleic acid molecule comprising a promoter sequence operably linked to a nucleic acid sequence, wherein the promoter sequence is capable of mediating gene
15 expression in anthers and in very young leaves in *Arabidopsis* and:
a) is derived from an *Arabidopsis KCS2* promoter sequence; or
b) hybridizes under stringent conditions to the *Arabidopsis KCS2* promoter sequence;
or,
c) is at least 70% identical to the *Arabidopsis KCS2* promoter sequence when optimally
20 aligned.
16. The recombinant nucleic acid molecule of claim 15, wherein the promoter sequence is derived from the *Arabidopsis KCS2* promoter sequence.
- 25 17. The recombinant nucleic acid molecule of claim 15, wherein the promoter sequence hybridizes under stringent conditions to the *Arabidopsis KCS2* promoter sequence.
18. The recombinant nucleic acid molecule of claim 15, wherein the promoter sequence is at least 70% identical to the *Arabidopsis KCS2* promoter sequence when optimally aligned.
- 30 19. The recombinant nucleic acid molecule of claim 15, wherein the promoter sequence is at least 90% identical to a wild-type *Arabidopsis KCS2* promoter sequence when optimally aligned.

20. A nucleic acid probe comprising a probe sequence that:
a) hybridizes under stringent conditions to a portion of an Arabidopsis *KCS2* genomic sequence; or
b) is at least 70% identical to the portion of an Arabidopsis *KCS2* genomic sequence when optimally aligned.
21. The nucleic acid probe of claim 20 wherein the probe sequence hybridizes under stringent conditions to a portion of the Arabidopsis *KCS2* genomic sequence.
22. The nucleic acid probe of claim 20 wherein the probe sequence is at least 70% identical to the portion of the Arabidopsis *KCS2* genomic sequence when optimally aligned.
23. The nucleic acid probe of claim 20 wherein the probe sequence is at least 90% identical to a portion of a wild-type Arabidopsis *KCS2* genomic sequence when optimally aligned.
24. A transgenic plant comprising the recombinant nucleic acid molecule of any one of claims 1 through 7.
25. A part of the transgenic plant of claim 24.
26. The part of the transgenic plant of claim 25, wherein the part is a seed.
27. The transgenic plant of claim 24, wherein the transgenic plant has a modified phenotype compared to a non-transgenic plant of the same species.
28. A transgenic cell comprising the recombinant nucleic acid molecule of any one of claims 1 through 7.
29. The transgenic cell of claim 28, wherein the cell is a plant cell.
30. A method of producing a transgenic plant comprising introducing into the plant the isolated nucleic acid molecule of any one of claims 8 through 14.

31. A progeny plant produced by sexual or asexual propagation of the transgenic plant produced by the method of claim 30.

Sub A5
5 32. A purified protein encoded by the recombinant nucleic acid molecule of any one of claims 1 through 7.

33. A recombinant vector comprising the recombinant nucleic acid molecule of any one of claims 1 through 7.

10 34. A recombinant antisense nucleic acid molecule wherein a portion of the heterologous nucleic acid coding sequence of claim 1 is in reverse orientation relative to an adjacent promoter sequence.

15 35. The recombinant antisense nucleic acid of claim 34, wherein the recombinant antisense nucleic acid encodes an antisense RNA that:

a) hybridizes under stringent conditions to a complement of a portion of the *Arabidopsis KCS2* coding sequence; or

b) is at least 70% identical to a portion of the *Arabidopsis KCS2* coding sequence when optimally aligned.

20 36. A Transgenic plant or plant cell comprising the recombinant antisense nucleic acid of claim 34 or 35.

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25 37. A method of isolating a nucleic acid molecule encoding a plant long chain fatty acid condensing enzyme, the method comprising hybridizing a nucleic acid preparation with the nucleic acid probe of any one of claims 20 through 23.